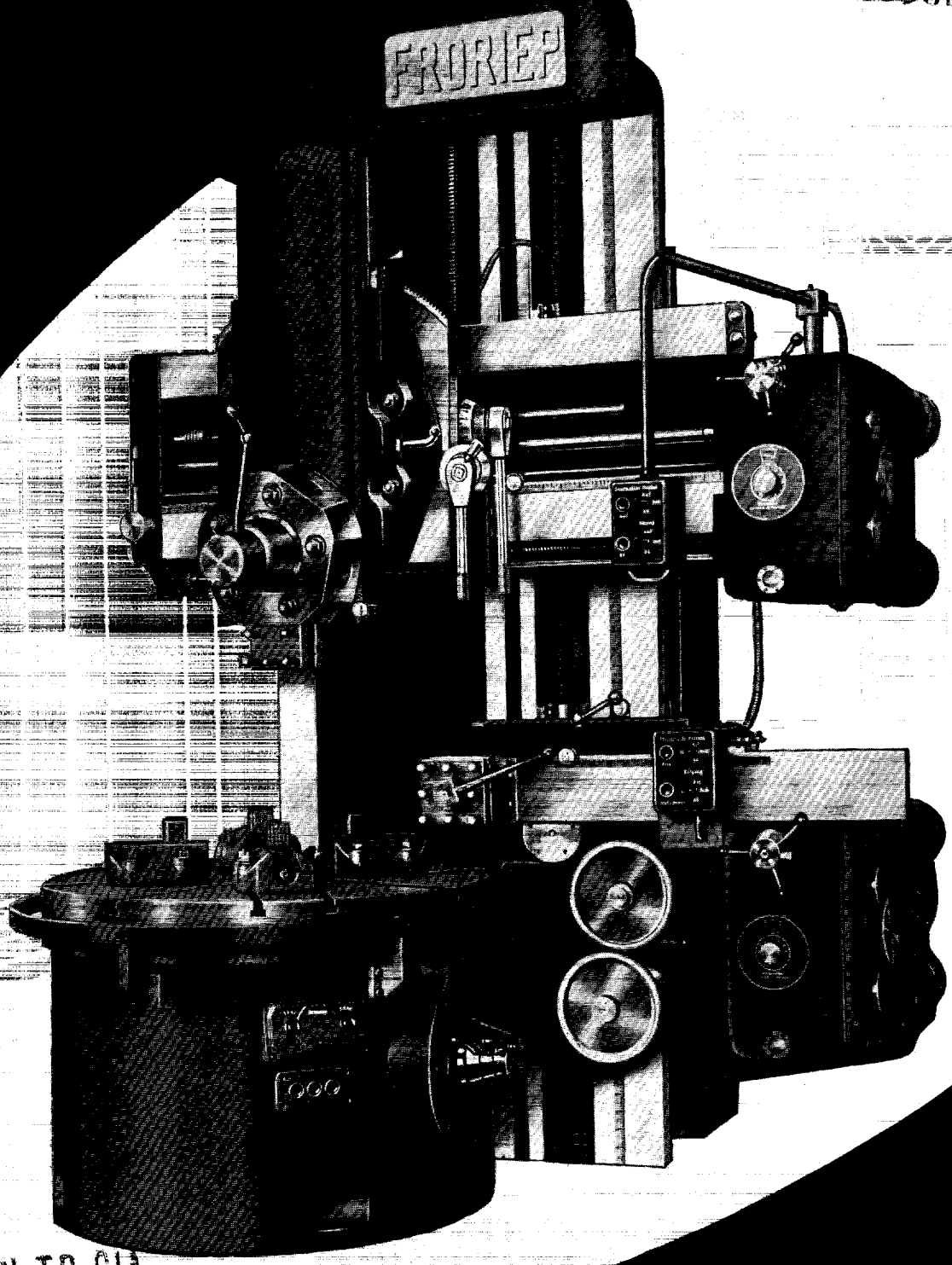
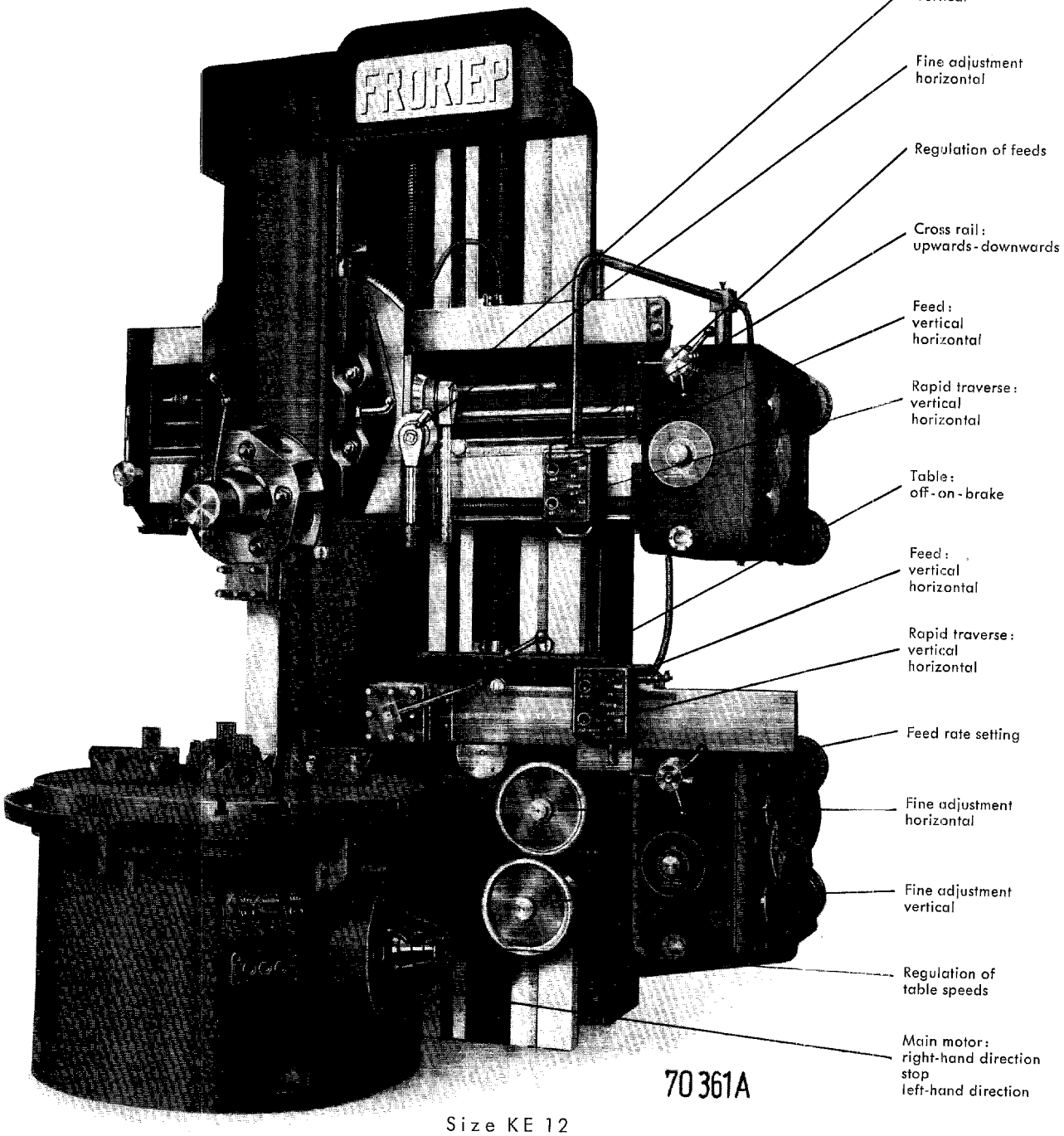


MASCHINENFABRIK **FRORIEP** GMBH, RHEYDT (RHLD.)

operating survey



Size KE 12

COSA CORPORATION
16923 JAMES COUZENS HIGHWAY
DETROIT 35, MICHIGAN
TELEPHONE: DIAMOND 1-1330
A. P. JOEN, DISTRICT MANAGER

FRORIEP Single Column Vertical Boring and Turning Mills with their rigid construction, localised simple controls and high productive capacity are used everywhere where high cutting capacity, convenience in operation, and special surface quality are required. They not only allow full use of the best carbide-tipped tools, but also take into account the possibility of further increases of capacity to be expected by further development in cutting tools.

Construction of our Vertical Boring and Turning Mills:

We manufacture Vertical Boring and Turning Mills for all machining requirements. Besides double column vertical boring and turning mills from a table diameter of 1750 mm up to the largest dimensions, single column vertical boring and turning mills are manufactured in series in four sizes from a table diameter of 1000 mm up to and including 1600 mm. The machine with a table diameter of 1000 mm can be delivered on request as a high-speed machine.

General:

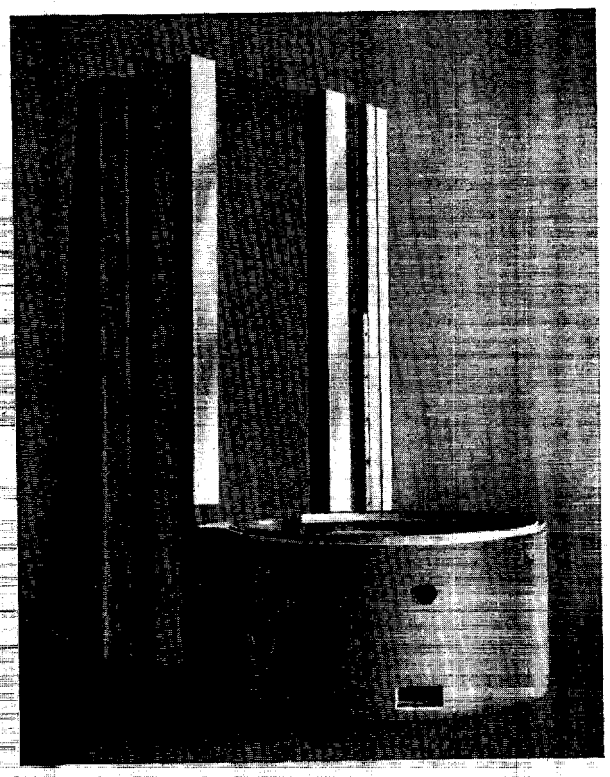
The single column vertical boring and turning mill with its all-electric centralized control from the operator's stand allows with its high speed range full use of high-speed and carbide-tipped tools. The handling time is cut down to a minimum, as the machine is controlled from a central point, namely from the swivelling push-button pendulum. The fine adjustment of the tool posts is located on the slides in such a manner that even with the smallest workpieces the tool cutting edge may be watched closely. On request the machines are supplied with the following special accessories:
Thread-cutting equipment, taper turning equipment, tripping device, tracing device by electric tracer control and coolant system.

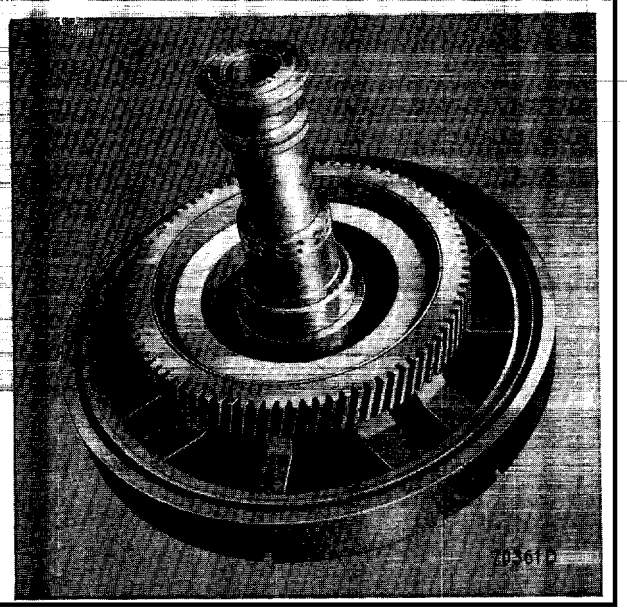
All sizes may furthermore be equipped with an infinitely variable speed drive by PIV-gears.

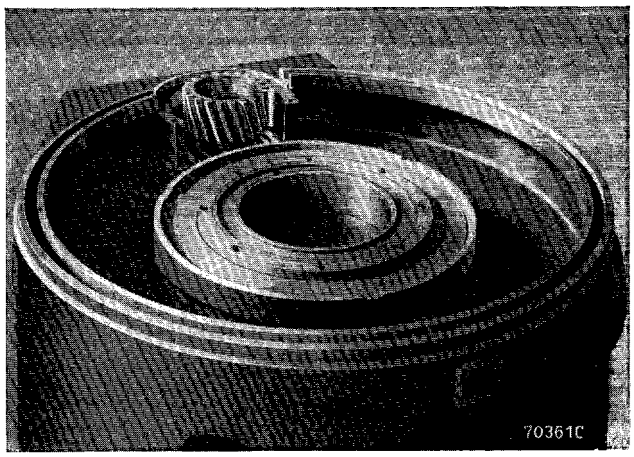
Base and column of the machine are rigidly bolted together. The exact position of both is fixed by the cylindrical guide of the driving gear box, guiding through the column into the base. Base and column rest with a wide base on the foundation. They are constructed in such a way that even at the heaviest cuts the machine works quietly.

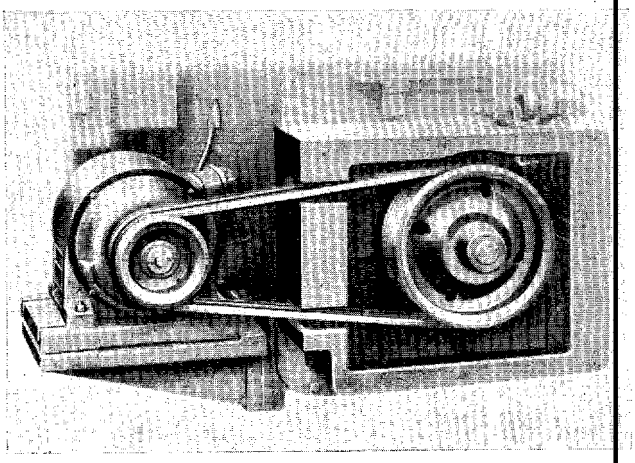
Table:

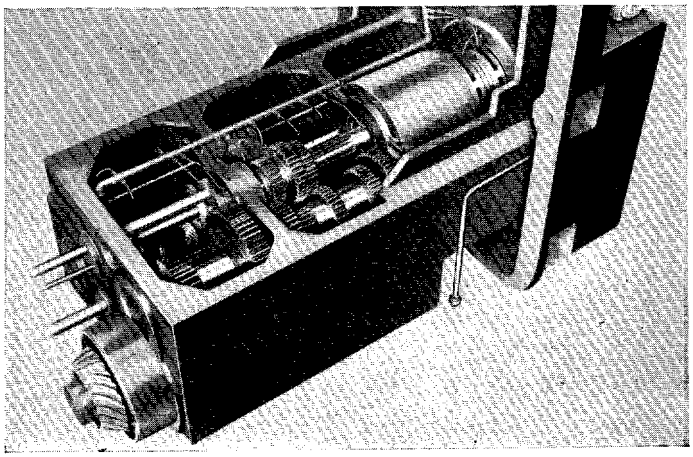
The table is provided with T-slots for fixing the chuck jaws or clamping bolts. The removable and adjustable chuck jaws of cast steel are kept parallel by planed gibs and can be clamped in the slots by four bolts. They are protected against unintentional drawing back by locking bolts falling into notches in the table. The hardened steel jaws are adjustable independently from each other by screw spindles. The table with a steel bearing surface is supported by the flat guide-way inserted in the base lined with high-grade bearing metal. The robust table spindle is held centrally by adjustable cylindrical roller bearings. An adjustable ball thrust bearing serves to relieve the wearing surface. This bearing arrangement guarantees exact concentric running and a clean surface of machined workpieces even at the highest speeds. Under the table is a gear rim with helical teeth driven by a pinion on the vertical pinion shaft. The pinion shaft is driven by means of hypoid bevel gears. The lubrication is effected by means of circulating lubrication as described later.







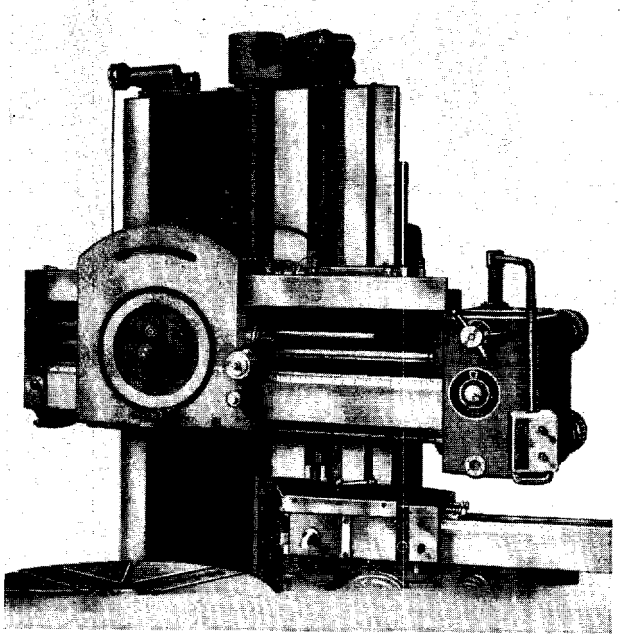




Main Drive:

The driving motor is mounted on a bracket which is attached to the rear of the column. The power transmission is obtained by V-belts.

The main gear is installed in an oil-tight gear box inserted from the rear into the column and base. An electro-magnetic disc clutch with similar brake serves to engage and to disengage the gear drive, controlled by push-button. The gear wheels are hardened and ground, the shafts are supported in anti-friction bearings. The geometrically graduated table speeds are controlled by three centrally placed levers. After adjustment of turning diameter and desired cutting speed, the table speed and the position of the adjusting levers may be read from the speed selector "Kienzle" attached next to them. The control of the main motor – "right-hand direction" – "stop" – "left-hand direction" is effected by push button from the same position.

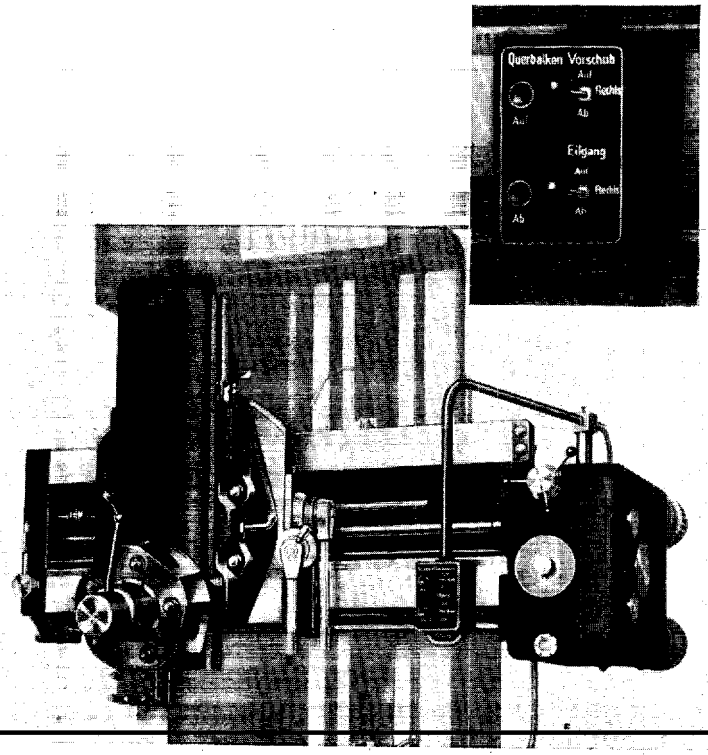


Cross Rail:

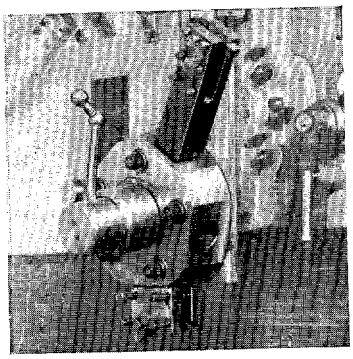
The cross rail is guided on long and narrow tracks along the column. Vertical adjustment is effected by a special adjusting motor, which is started by push-button switch mounted on the pendulum-type panel. The cross rail is disengaged automatically by limit switches when reaching its highest or lowest position. Clamping is by clamping screws.

Cross Rail Head:

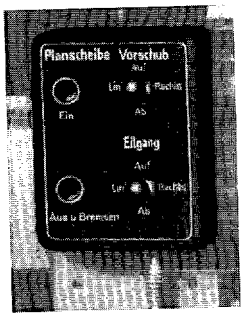
The cross rail head is guided and adjusted by wedge-shaped gibs along narrow tracks, and is able to swivel 45 deg. in a clockwise direction and 35 deg. in an anti-clockwise direction from the central position. The turret slide is counterbalanced and moves in long rectangular guides which can be adjusted by wedge-shaped gibs. The fine adjustment of the head is located on the slides in such a way that, even with the smallest workpieces, the tool cutting edge may be watched closely.

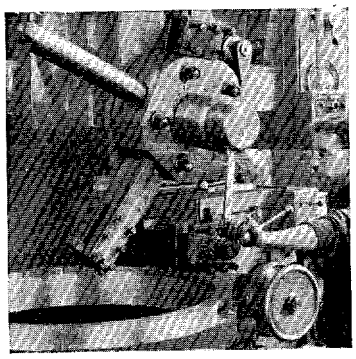


SINGLE COLUMN VERTICAL BORING AND TURNING MILLS

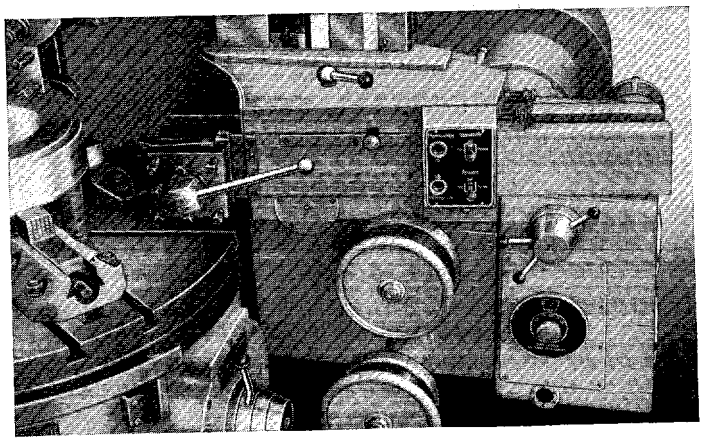


Pentagon Turret clamped in position





Swivelling of the turret



The Pentagon Turret:

The pentagon turret can be easily and exactly released, swivelled, fixed and clamped by operating one lever. The tools are clamped by clamping sleeves.

Side Arm:

The side arm slides on a long, narrow guide directly on the column and is balanced by a counter-weight, which is placed within the column. The tool slide is of strong design and provided with carefully machined, adjustable guides. The tool holder, designed for four tools, is fastened by an eccentric clamping device. Fine adjustment of the head in vertical and horizontal directions is obtained by operating hand wheels on the slide.

Feed Boxes:

The feed boxes for cross rail head and side arm are of identical design and operate independently from each other. They incorporate the gearing for feed and rapid power traverse. The geometrically graduated gears for vertical and horizontal motions are controlled by three centrally placed levers. The position of the levers can be read from the selector disc after setting the rate of feed. Special motors are mounted on the rear of the feed box for the rapid power traverse in vertical and horizontal directions. All feeds and rapid motions are controlled, by electro-magnetic clutches, with single lever control from the pendulum switch board at the operator's stand.

Rules and Graduated Discs:

Rules are provided for reading the horizontal and vertical movements of the heads, and dials with 0,02 mm divisions for reading the fine adjustment. The graduation on the cross rail slide indicates the inclination of the tool slide.

Lubrication:

Lubrication of the machine is arranged so that each unit is lubricated separately. The following are equipped with automatic circulating lubrication: gear box with base and table bearings and the two feed boxes. The following are lubricated by common hand central lubricator: both heads, column and cross rail guides and cross rail adjusting gear. For the lubrication of the gear box, support and table bearings there is a gear pump provided, fitted on the rear of the column. This gear pump passes the oil from the oil reservoir of the column over a filter into a distributing pipe, and, passing through branch pipes, the oil finally reaches the individual lubricating points. The correct working of the oil circulation is indicated by the inspection lamps. Built into every feed box is a mechanically driven gear pump. This gear pump passes the oil from the collecting tank into a distributor, and from there every lubricating point is supplied with oil. The inspection glass on the feed box indicates the oil circulation.

SPECIAL ACCESSORIES:

On customers' request and at extra cost the following special accessories can be supplied:

Self-centering table:

For series production of identical workpieces it is advisable to use the self-centering table, which is provided with three adjustable jaws on long table slides. The jaws can be operated independently and together.

Air Chuck:

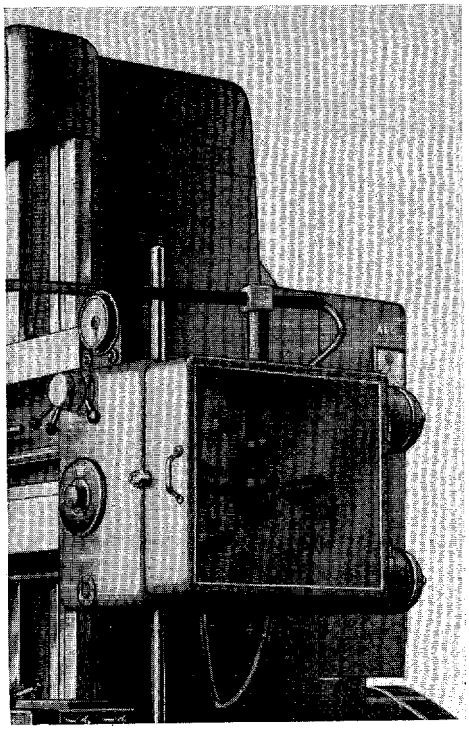
For rapid clamping and unclamping of identical workpieces the machine can also be supplied with an air chuck. The jaws are controlled from the operator's working position by a regulating tap. Each jaw can be adjusted manually by an adjusting screw.

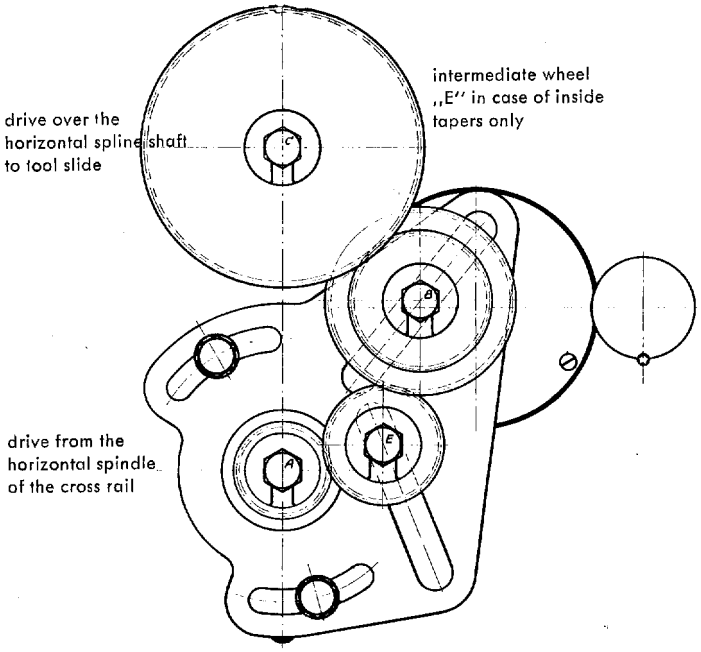
Cooling Attachment:

On request the machine can be supplied with cooling equipment. For this purpose the table is provided with a circular drip pan for the coolant, which runs back into a collecting tank. A special pump passes the coolant, after regulation by taps, through distributing pipes to the two consumption points at the cross rail head and side arm.

Multiple Tripping Device:

When multiple tooling is required on the cross rail turret in mass production it will be desirable to set the tools by a clock gauge fixed to the head. For this purpose the cross rail slide is provided with a pentagonal rod having five adjustable stops which can be set to disengage the feed by means of limit switches. The feed of 0.01 mm can be read from a clock gauge. The side head can also be provided with a similar device.





Tracing Attachment by electric tracer control:

If the machine should be used for turning profiles, we would recommend our tracing device by electric tracer control, which can be supplied for both the cross rail head and the side arm. The tracer, fitted to the tool slide, moves along a profile plate, which is shaped like the workpiece to be machined, and controls the tool post by way of electro-magnetic clutches.

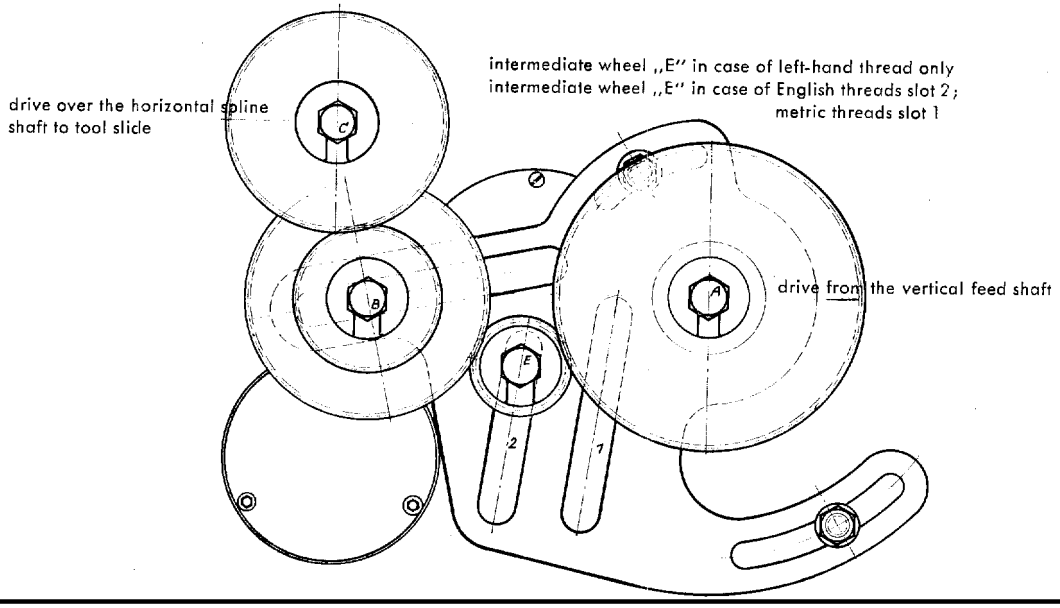
Taper Turning Attachment for Cross Rail Slide:

For the machining of tapered faces with angles of inclination between 3 and 45 deg. to the horizontal, it will be useful to use the attachment which enables such tapers to be produced by applying the change gears. In this case the tool slide receives its vertical feed motion over the change gear "A", arranged at the end of the cross rail, from the horizontal feed of the cross rail slide. In order to manage with a few change gears, tables are supplied with the machine, showing approximate values. The intermediate values can be obtained by swivelling the tool slide. Tapers with an angle of inclination of more than 45 deg. can be turned by swivelling the tool slide around the 90 deg. angle minus the angle of inclination.

Thread Cutting Equipment:

By the use of change gears it is possible to cut English and metric threads with great accuracy using the cross rail head. In this case the tool slide receives its feed motion over the change gear "A", arranged at the end of the cross rail, with drive from the vertical feed shaft "A".

Change gear tables for cutting English and metric threads will be supplied with the machine.

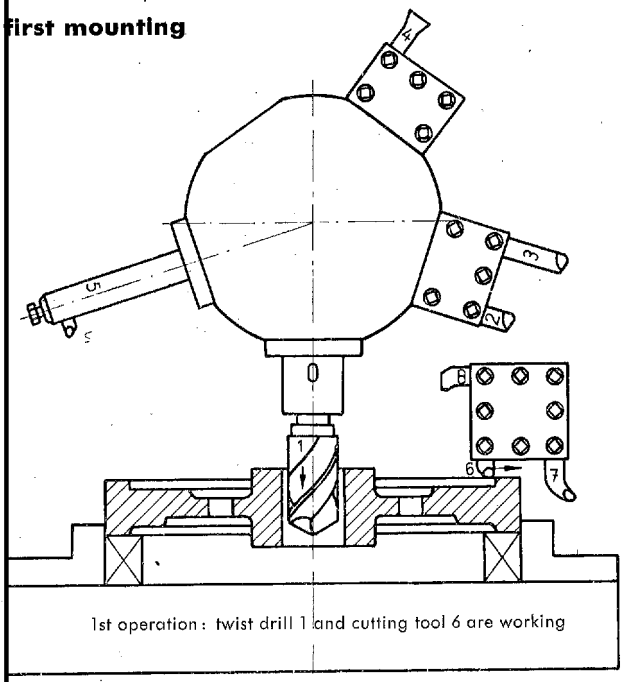


MACHINING EXAMPLE

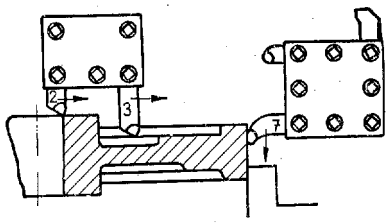
Machining of a flywheel

Material: Ge. 18.91 (cast iron)

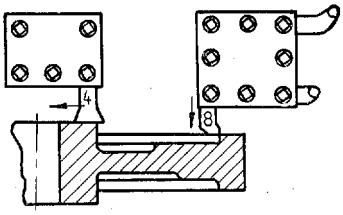
first mounting



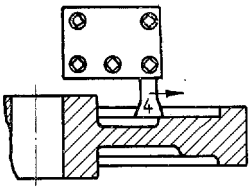
1st operation: twist drill 1 and cutting tool 6 are working



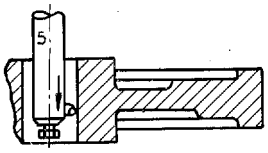
2nd operation:
cutting tools 2, 3 and 7 are working



3rd operation:
cutting tools 4 and 8 are working

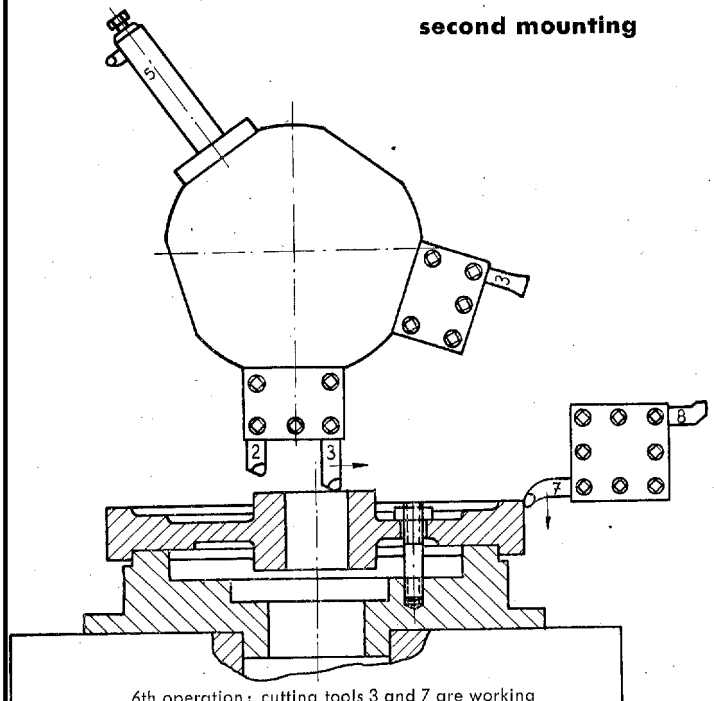


4th operation:
cutting tool 4 is working

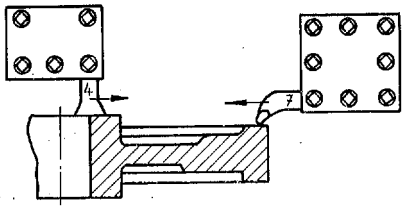


5th operation:
cutting tool 5 is working

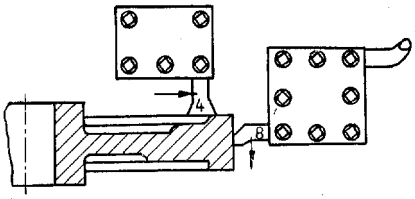
second mounting



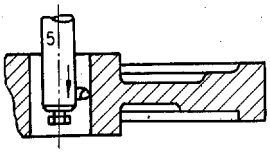
6th operation: cutting tools 3 and 7 are working



7th operation: cutting tools 4 and 7 are working



8th operation: cutting tools 4 and 8 are working

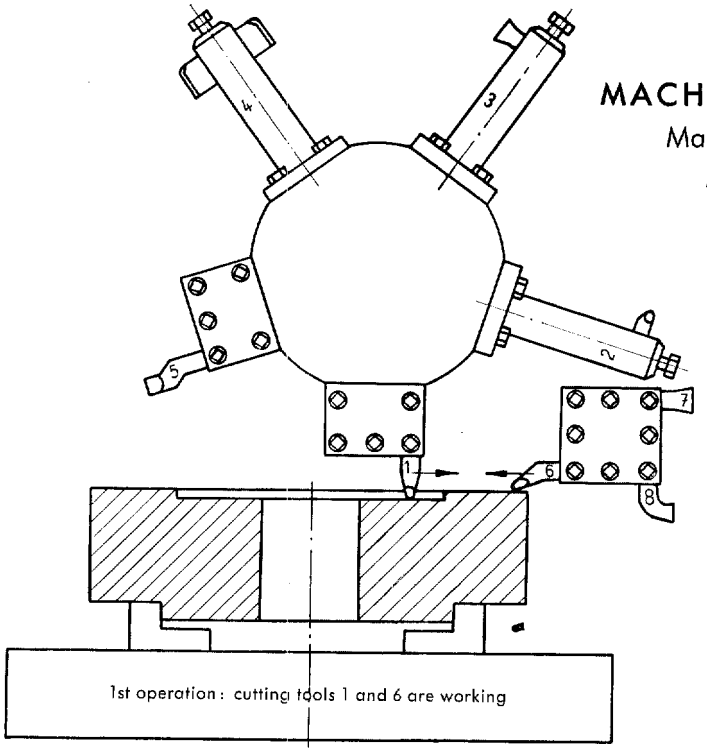


9th operation:
cutting tool 5 is working

MACHINING EXAMPLE

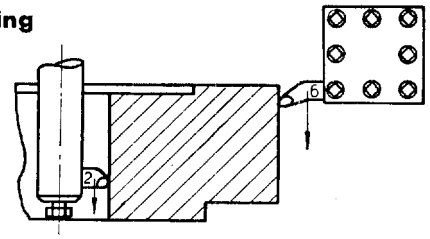
Machining of a wheel

Material: Steel

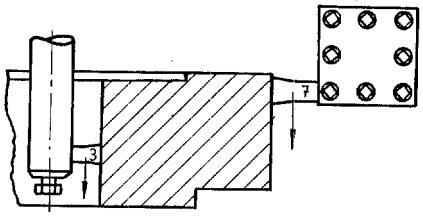


1st operation: cutting tools 1 and 6 are working

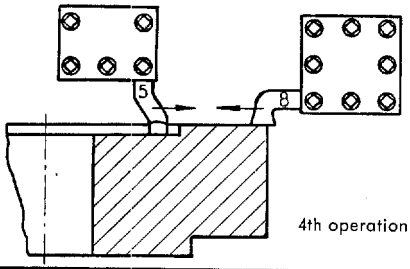
first mounting



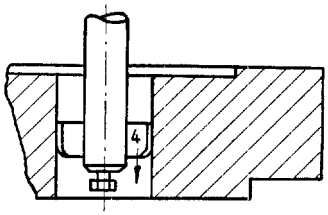
2nd operation: cutting tools 2 and 6 are working



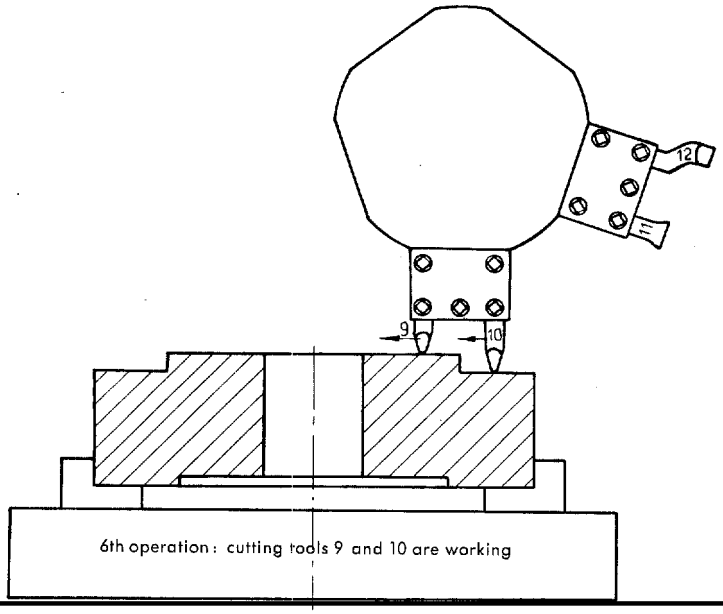
3rd operation: cutting tools 3 and 7 are working



4th operation: cutting tools 5 and 8 are working

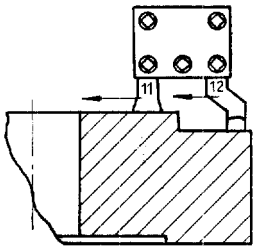


5th operation: cutting tool 4 is working



6th operation: cutting tools 9 and 10 are working

second mounting

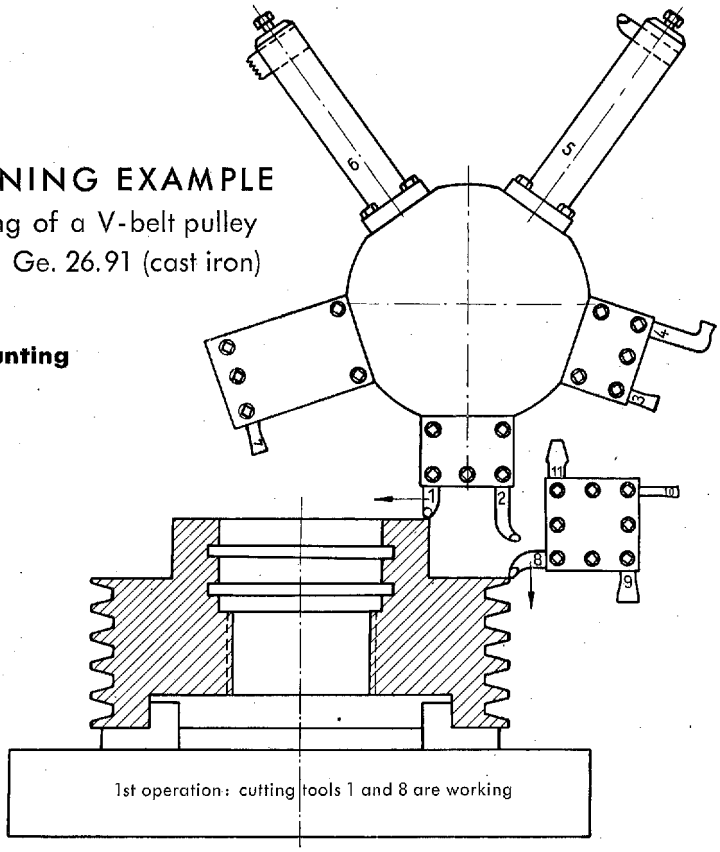


7th operation: cutting tools 11 and 12 are working

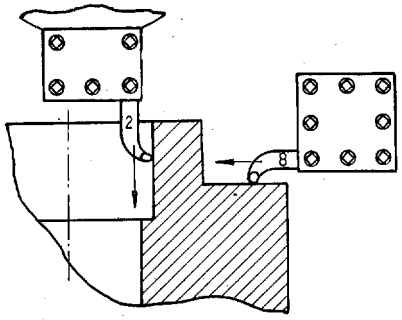
MACHINING EXAMPLE

Machining of a V-belt pulley
Material: Ge. 26.91 (cast iron)

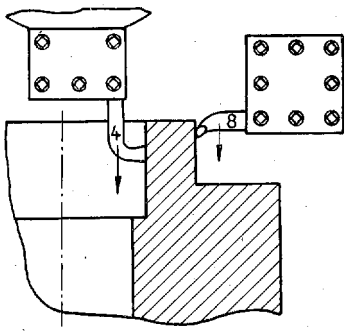
first mounting



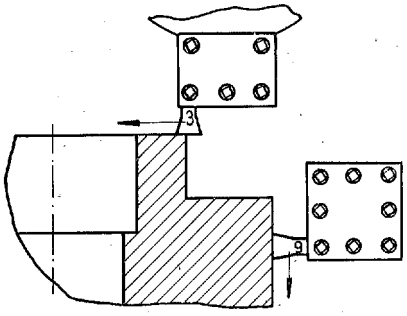
1st operation: cutting tools 1 and 8 are working



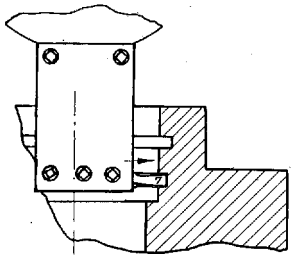
2nd operation: cutting tools 2 and 8 are working



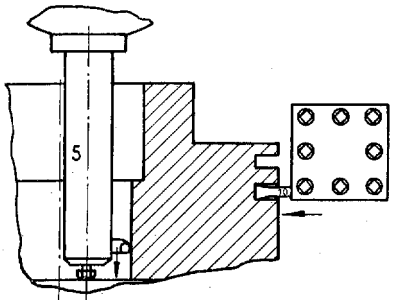
3rd operation: cutting tools 4 and 8 are working



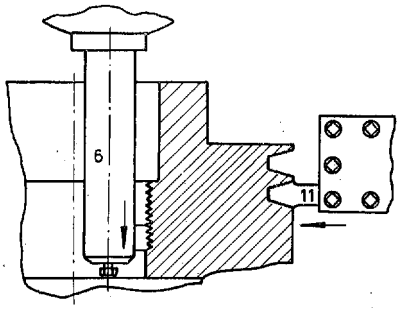
4th operation: cutting tools 3 and 9 are working



5th operation: cutting tool 7 is working

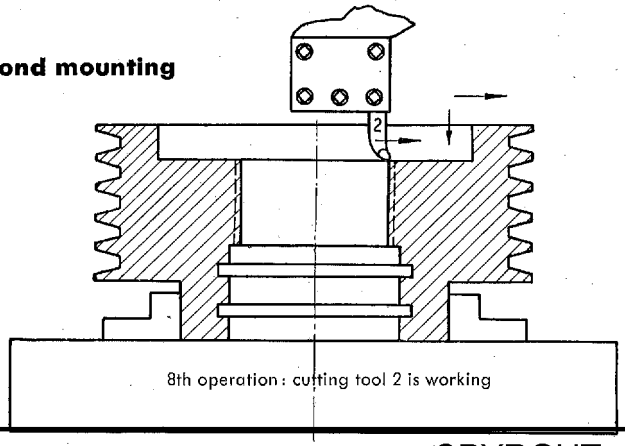


6th operation: cutting tools 5 and 10 are working

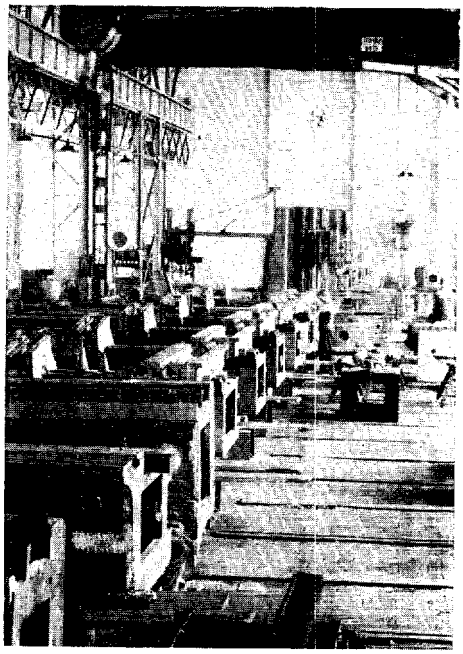


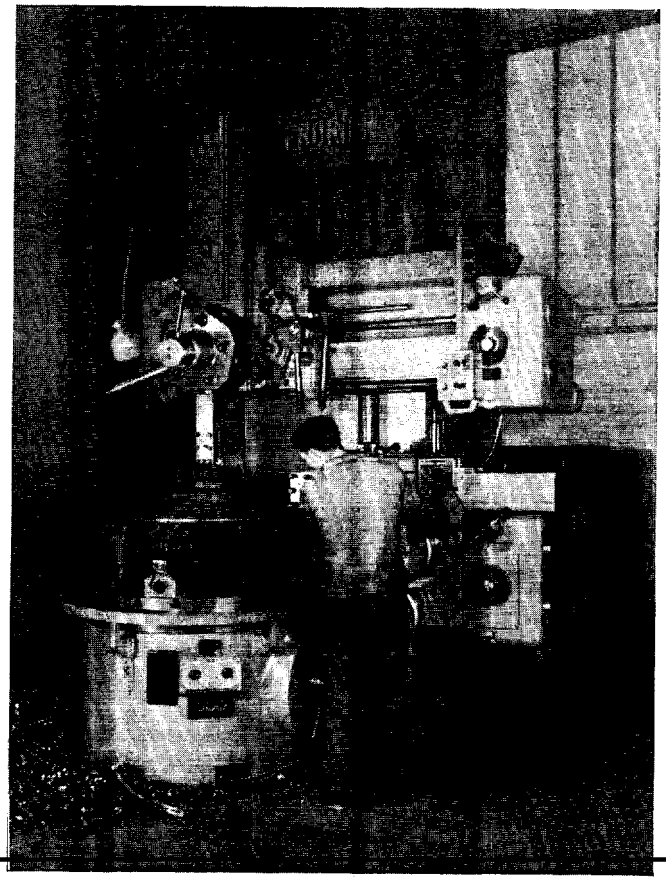
7th operation: cutting tools 6 and 11 are working

second mounting



8th operation: cutting tool 2 is working





SINGLE COLUMN VERTICAL BORING AND TURNING MILLS

Main Dimensions

Size		KE 10	KE 12	KE 14	KE 16	KE 10 S
Table diameter	inches	40	49	55	63	40
Max. turning diameter with cross rail slide	inches	45	55	63	69	45
Max. turning diameter with side arm	inches	42	51	59	65	42
Max. turning height above table	inches	42	44	44	49	42
Max. weight of work piece	tons	3	4	4	5	3
Number of table speeds		18	18	18	18	18
Speed range of table	r p.m.	3,6 - 180	2,8 - 140	2,8 - 140	2,24 - 112	7 - 350
Number of feeds, vertical and horizontal		12	12	12	12	12
Range of feeds per revolution, vertical and horizontal	inch./rev.	·004 – ·40	·004 – ·40	·004 – ·40	·004 – ·40	·002 – ·20
Vertical adjustment of tool slide on cross rail slide	inches	25	28	28	32	25
Number of turret tool holes		5	5	5	5	5
Diameter of turret tool holes	inches	3,15	3,15	3,15	3,15	3,15
Horizontal adjustment of tool slide on side arm	inches	22	27	30	33	22
Adjustment of cross rail, raising and lowering	inches/min.	24	24	24	24	24
Rapid traverse of heads and tool slides in all directions	inches/min.	80	80	80	80	80
Power of main motor	h.p.	50	50	50	60	50
Revolutions of main motor	r.p.m.	1450	1450	1450	1450	1450
Power of motor for cross rail adjustment	h.p.	4,5	4,5	4,5	4,5	4,5
Power of motors for rapid traverse of heads and tool slides	h.p.	1,5	1,5	1,5	1,5	1,5
Max. cross-section of tools to be clamped	inches	1,6 x 1,6	1,6 x 1,6	1,6 x 1,6	1,6 x 1,6	1,6 x 1,6
Max. torque on table	mkgs.	1600	2000	2000	2500	1200
Max. cutting force per head	kgs	4000	4000	4000	4000	4000
Total chip section in steel 60 at 60 m/min. cutting speed	sq. inches	,700	,700	,700	,900	,700
At mean turning diameter of	inches	25	32	35	40	20
Resulting total chip section	sq. inches	1,25	1,25	1,200	1,25	1,200
Space requirements of machine						
Width	inches	91	98	102	118	91
Depth	inches	118	126	130	145	118
Height	inches	126	138	138	143	126
Net weight of machine without electrical equipment	kgs	14500	16800	17500	20000	14500

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